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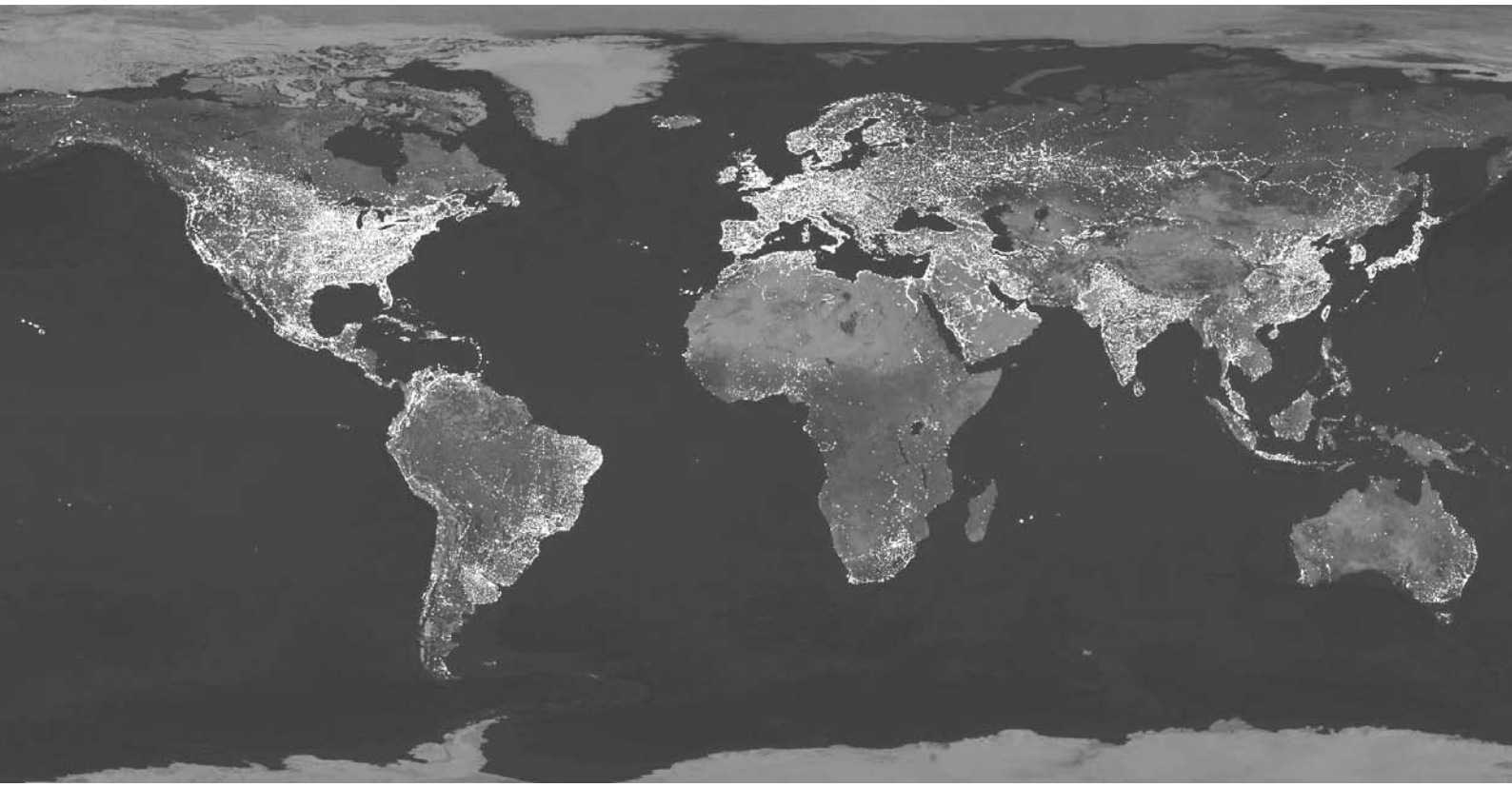
Europe 2020: an Alternative Proposal

Update 2009

by Carlo Stagnaro



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Abstract

The European Union has unilaterally decided to implement a cap & trade scheme to contain greenhouse gases (GHGs) emissions, starting on 1 January 2005. After the First Phase of the Scheme had been concluded on 31 December 2007, emissions from the sectors covered by the European Emissions Trading Scheme (ETS) had actually increased. That is not enough to tell that the scheme didn't work: there are too little data to perform a credible assessment. The literature on the issue is not unanimous. It seems plausible, however, that some permits over-allocation occurred in 2005, that might explain the not-so-exciting performance of the scheme. In fact, to some extent some over-allocation was also acknowledged by the European Commission itself, which adopted more stringent criteria for the Second Phase of ETS (2008-2012). Now the criteria and the rules for the Third Phase (2013-2020) are being debated, with an emphasis over defining even more stringent criteria and a shift from a grandfatherin system in the initial allocation (whereby allowances are initially given free-of-charge on the basis of historical track records for emissions), towards a partial auctioning system (whereby permits are initially given to the highest bidders), with a goal of a full auctioning in 2027. At the same time, safeguard measures are being considered in order to prevent "carbon leakage" (i.e. delocalization due to higher costs of energy) in the energy-intensive economic sectors or sub-sectors that are exposed to international competition. This paper examines the guidelines for the Energy Policy for Europe by assessing its effectiveness in achieving the stated environmental targets, assuming not every country in the world will be willing to pursue similar targets. Subsequently, it identifies the major shortcomings in the European policies, that mostly depend on the complexity and possible politicization of the ETS. Finally, it reviews the possible alternatives, by emphasizing the benefits that a revenue-neutral carbon tax might deliver both in terms of reaching the environmental goals, and of the policy's efficiency and allocational efficiency. Two models of carbon tax are considered: one defined on the basis of the expected social cost from GHGs emissions, the other dependent on a state function that measures the degree of global warming in any given year.

2 March 2008
Carlo Stagnaro

1. An Energy Policy for Europe

The reduction of greenhouse gas emissions is the cornerstone of the new Energy Policy for Europe (EPE). If, at a rhetorical level, the Union aims to be and remain a global leader in the fight against climate change,[1] in practice the environmental policy is the only way for the European Commission to influence the national governments' energy policies. In fact, the European Treaty doesn't include energy policy within the community's area of jurisdiction.

It is in this context that the European Council held in the spring of 2007 formulated the ambitious goals of cutting European greenhouse gases (GHGs) emissions by 20% below the reference year by 2020; increasing the share of renewable energy sources up to 20 % of primary energy consumption; and reducing by 20 % the total consumption below the baseline. Such objectives have been somehow downsized – the renewable share is to be referred to final energy consumption, will the total consumption reduction goal has been turned into a non-binding target of increasing energy efficiency by 20 %. The way to achieve such goals is embodied in a package of directives that was launched by the European Commission on January 23rd, 2008. Since then, a wide debate has been involved and some major changes have been made. Technical issues are being debated, too. After a long negotiation in late 2008, the Commission has proposed an amended version of the Directive, which has been passed by the EU Parliament and is now to be ratified by the member States.[2]

As far as emissions reductions are concerned, Europe plans to strengthen its Emissions Trading Scheme (ETS), a "cap & trade" mechanism that has been in place since January 1st, 2005.

This paper intends to examine the objective of emission reductions. First we will evaluate the usefulness of this objective from the point of view of its environmental impact. In the second part we will look at the performance of European climate policies, while the third will be focused on the Emissions Trading Scheme (ETS). Although the available data refer to a relatively short period, some elements have already emerged and deserve deep reflection. Finally, in the fourth part, we will compare the approach that the EU currently takes – the quantitative one – with an alternative path, that is, the imposition of an environmental tax.

1 So said European Commission President José Manuel Barroso, who – in a statement released on December 15th, 2007 – attributed to Europe's "leadership" the "successful outcome" of Bali negotiations. See http://europa.eu/rapid/pressReleasesAction.do?reference=IP/07/1941&format=HTML&aged=0&language=EN&guiLanguage=en

2 http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2008-0610+0+DOC+XML+V0//EN&language=EN

2. Are European climate policies any useful?

The objective of the European climate policies is to "adopt the necessary domestic measures and take the lead internationally to ensure that global average temperature increases do not exceed pre-industrial levels by more than 2°C". For the Commission, "this is technically feasible and economically affordable if major emitters act swiftly. The benefits far outweigh the economic costs."[3] This statement – contained in a communication of the Communitarian executive preceding the spring European Council – rests on a previous communication of 2005 (that "demonstrated that the benefits of limiting climate change outweigh the costs of action"),[4] and also rests on the *Stern Review* (Stern 2006).

The 2005 communication "demonstrates" that the benefits exceed the costs in a succinct 12-line paragraph to which were added two annexes on the effects of climate change (two faces of a sheet of paper compiled into points without even one bibliographic reference even when long-term projections are given) and a cost-benefit analysis (less than three pages where the following quote by IPCC is reported: "comprehensive, quantitative estimates of the benefits of stabilization at various levels of atmospheric concentrations of greenhouse gases do not yet exist.").[5] Another reference is the Staff Working Paper,[6] which supplies all the material behind the communication. This is a more articulate document consisting of 51 pages which, of course, "demonstrates" nothing, as it does not contain anything that is original other than a review of the literature – which, however, does not even mention less pessimistic studies – with the ambition of summing up the body of the scientific and economic knowledge on cause and effect of global warming and costs and benefits of the different policy options. Similar considerations apply to the Staff Working Paper in support of the 2007 Communication,[7] which picks up and updates the preceding paper.

The reference to the *Stern Review* is seemingly more solid. The report was commissioned by the British government to the former World Bank chief economist, Nicholas Stern, with the objective "to understand more comprehensively the nature of the economic challenges and how they can be met, in the UK and globally".[8] The most shocking and emphasized result of the report – some 575 pages of analysis of evidence and studies available on the economic aspects of global warming – is the forecast that, depending on the climate scenario, in the absence of countermeasures, the global mean temperatures growth could bring about economic losses ranging from 5 to 20 % of the global GDP. It is a resounding result, as the previous estimates gravitated around 1 %, which is also the order of magnitude of the mitigation costs according to many authors. To get to such a figure, Sir Nicholas makes two singular hypotheses: on one hand, he assumes a discount rate next to zero (0.1 %); on the other, he refers systematically to the most alarmistic studies on the possible consequences of global warming. In all cases, by simply adopting a discount rate of 3 % – a value typically employed in the literature – the estimated costs of the greenhouse effect effect crumbles, according

3 European Commission, "Limiting Global Climate Change to 2 degrees Celsius", COM(2007) 2, http://europa.eu/press_room/presspacks/energy/comm2007_02_en.pdf, p.2.

4 *Ibid.*, p.4.

5 European Commission, "Winning the Battle Against Global Climate Change", COM(2005) 35, http://ec.europa.eu/environment/climat/pdf/comm_en_050209.pdf, pp.4 and 12-16.

6 http://ec.europa.eu/environment/climat/pdf/staff_work_paper_sec_2005_180_3.pdf.

7 http://ec.europa.eu/environment/climat/pdf/ia_sec_8.pdf.

8 http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_backgroundtoreview.cfm.

to the scenario, from 5-20 % to 0.4-1.1 % of the global GDP (Dasgupta 2006; Galeotti and Lanza 2006; Nordhaus 2007; Tol 2006).

Tol and Yohe (2006, pp.233-234) go as far as to find six critical issues in the *Review*. Of these, four refer to technical limits of the *Review*:

- First, The *Stern Review* does not present new estimates of either the impact of climate change or the costs of greenhouse gas emission reduction. Rather, the *Stern Review* reviews existing material. It is therefore surprising that the *Stern Review* produced numbers that are so far outside the range of the previous published literature;
- Second, the high valuation of climate change impacts reported in the *Review* can be explained by a very low discount rate, risk that is double-counted, and vulnerability that is assumed to be constant over very long periods of time (two or more centuries, to be exact). The latter two sources of exaggeration are products of substandards analysis. The use of a very low discount rate is, of course, debatable;
- Third, the low estimates for the cost of climate change policy can be explained by the *Review*'s truncating time horizon over which they are calculated, omitting the economic repercussions of dearer energy, and ignoring the capital invested in the energy sector. The first assumption is simply wrong, especially since the very low discount rates put enormous weight on the other side of the calculus on impacts that might be felt after the year 2050. The latter two are misleading;
- Fourth, the cost and benefit estimates reported in the *Stern Review* do not match its policy conclusions. If the impacts of climate change are as dramatic as the *Stern Review* suggests, and if the costs of emission reductions are as small as reported, then a concentration target that is far more stringent than the one recommended in the *Review* should have been proposed. The *Review*, in fact, does not conduct a proper optimization exercise.

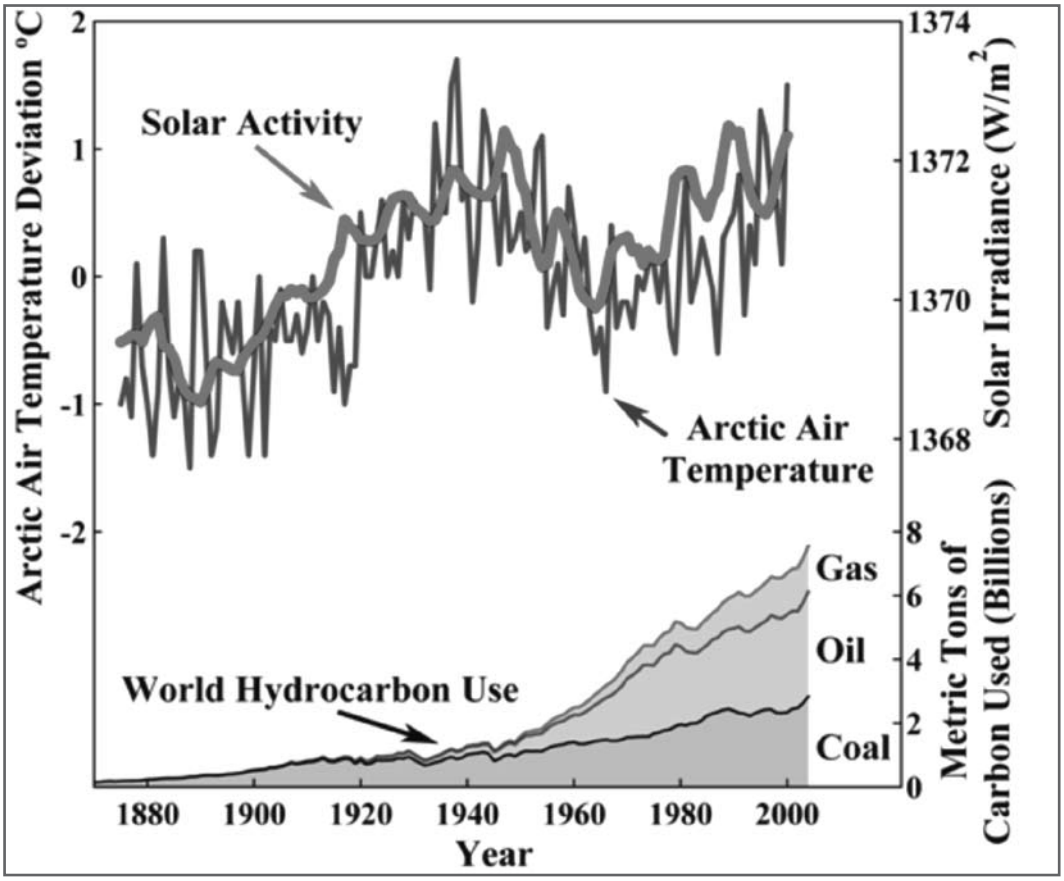
But the weakness – or at any rate the selectivity of the calculations used by the European Commission – is not the most exposed flank of the Communitarian strategy. The deepest problem concerns policy objectives, functions, and consistence.

The final goal of the European policies is to contain the increase in global temperatures within the magic threshold of two degrees centigrade. Obviously, this is a symbolic value, because there is no reason to believe that a warming of up to two degrees is harmless, while a greater increase in temperatures, no matter how small, will bring about any kind of disasters. Furthermore, it risks becoming an unrealistic objective. Although Europe is persuaded of the human responsibility for climatic changes, no one can exclude that all or part of the temperature increase is governed by natural dynamics such as solar cycles (see Fig. 1) (Soon and Yaskell 2004).[9] Therefore, Brussels could have set a target that goes beyond the powers that mankind – leave aside Europe – has today of influencing the environment. In this sense, it would have been desirable to express the objective in terms of stabilization of atmospheric concentrations of carbon dioxide and other greenhouse gases. Furthermore, the ratio between CO_2 emissions and temperature variation (which, rather, depends on the concentrations, not on the emissions) is subject to great uncertainties, so there is an extremely high degree of arbitrariness in the definition of the necessary emission reductions and in their temporal displacement to the end of limiting the growth to two degrees – and not 2.01, or 2.1 or 3°C.

9 http://www.oism.org/pproject/GWReview_OISM150.pdf.

Figure 1

Artic temperature, solar activity and cumulative hydrocarbon consumption



Source: Robinson, Robinson and Soon (2007)

The Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC 2007) evaluates temperature increase by 2100 in the interval 1.8-4.0 degrees centigrade in the different scenarios. In six scenarios out of seven, the lower end of the fork is equal to or greater than 2 degrees, and in scenario 4 it is even smaller than 1.5 degrees.[10] That means that there is a good probability – even assuming that the hypothesis and conjectures at the basis of the IPCC scenarios are valid – that the increase of temperature *in the absence of any political measure* stays below the critical threshold of two degrees. This fact in itself should supply a precise policy indication: as it is possible that the European efforts are useless – one way or another – they should be conceived in such a way so as to allow for adjustments in a relatively quick and simple manner as the scientific evidence grows and allows the unveiling of at least some of the many unknowns at the basis of the global warming phenomenon.

During the Spring 207 European Council, the leaders of the member States committed to a reduction of emissions of at least 20 % by 2020, but also re-launched a further commitment to reduce the emissions by 30 % if it becomes possible to find an agreement between all industrialized countries.[11] This is contradictory. If the emissions cause

10 Ipcc, "Summary for Policymakers", in *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report* (Cambridge, UK e New York, NY: Cambridge University Press), http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_SPM.pdf, p.13.

11 Council of the European Union, Presidency Conclusions, 8-9 March 2007, 7224/1/07, http://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/93135.pdf. Sections 31 and 32 state,

global warming and preventing global warming is the European political priority, then the commitment to reduce emissions should be stronger, as the participation of other countries is smaller. In fact, the presumed cause of global warming comes from global emissions; in the absence of reductions by other countries, Europe should do more, not less, so that the same result is achieved. Why is the Commission not following this simple logic? The answer, which is never given in the official documents of the Union, is that the Commission believes, correctly, that the reduction in emissions represents a ballast for economic growth and which causes a loss of international competitiveness. Europe does not want to push beyond a certain limit which is set arbitrarily, without any preliminary study, and quantified by 20 %. That is obviously because it believes that the cost for the European economy would be by far greater than environmental benefits which are uncertain and at any rate remote in time. Therefore, implicitly, the EU reasons about the future with a discount rate which is quite different than the 0.1 % used by Stern, and hence it demonstrates with facts that it does not believe in the studies that it nevertheless calls on to support its policies. Then how do we explain the European choices? It is not the objective of this paper to put intentions on trial, nor to investigate the ideological motivations or economic advantages of some effective and well-organized pressure groups in Brussels, Berlin, London and in other member States that have been pushing hard to set climate policies in motion. To the ends of this reflection, what is relevant is that, in fact, the European Union gives economic weight to "salvaging the climate" and that, regardless of the numbers, it attempts to reconcile the verbal extremism with a series of practical caveats. We can see that in a whole series of details – and anybody knows that the devil's right there. For example, at the same time as the EU promotes biofuels (even by adopting a specific target of 10 % of the market share by 2020), it prevents or discourages, through customs duties, the import of biofuels coming from tropical countries, which are more economical and characterised by a lower environmental impact as compared to those produced in Europe. In this case, the EU seems to put the creation of a safety net for European agriculture (which is threatened by the reform of the common agricultural policy) before actual climate salvation (Clini 2007; Stagnaro 2007). But even this risks leading us astray. In fact, regardless of the internal contradictions or perhaps excessive ambitions of European policy, another element exists that dictates the possible irrelevance of this measure: the rest of the world.

Europe, in fact, does not act in a void, but the background of its actions consists in the decisions of other nations. It is of course an ever-changing background that moves in function of endless variables – social, economic and political in the first place – to which Europe itself belongs. That is, European decisions are seen by other actors, which react in sometimes a cooperative and sometimes an opportunistic manner. When we talk about choices in energy policy, however, the influence of the EU on the rest of the world is relatively low, because the time horizon of such decisions is very long. Today, everybody is an heir of the choices made yesterday, and those choices count for more than the acceleration of a certainly important actor (but perhaps less important than

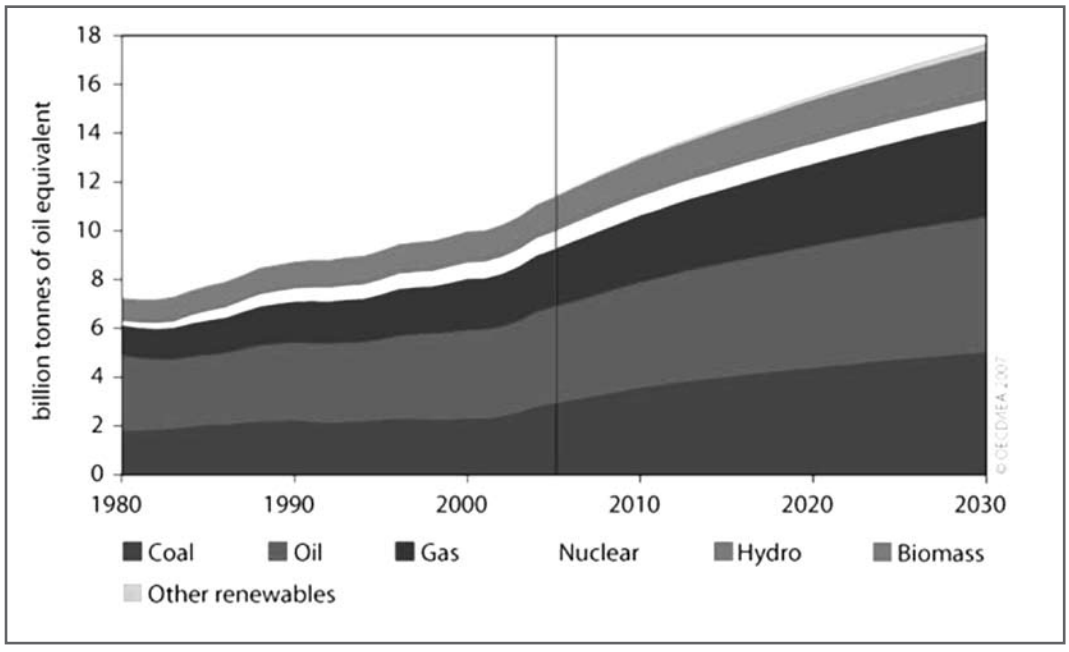
respectively: "the European Council endorses an EU objective of a 30 % reduction in greenhouse gas emissions by 2020 compared to 1990 as its contribution to a global and comprehensive agreement for the period beyond 2012, provided that other developed countries commit themselves to comparable emission reductions and economically more advanced developing countries to contributing adequately according to their responsibilities and respective capabilities". Moreover, "The European Council emphasises that the EU is committed to transforming Europe into a highly energy-efficient and low greenhouse-gas-emitting economy and decides that, until a global and comprehensive post-2012 agreement is concluded, and without prejudice to its position in international negotiations, the EU makes a firm independent commitment to achieve at least a 20 % reduction of greenhouse gas emissions by 2020 compared to 1990."

European governments might wish) such as the European Union. Therefore, although one can maintain that Europe could lead other nations on the sustainability path by example, so far that does not seem to have materialized, and the EU seems to be a leader without followers. It is therefore reasonable to assume that, at least in the short and medium terms, the other countries will mainly follow domestic logic, and thus, the consequences of European choices must be evaluated within a "business as usual" scenario for the rest of the world.

According to the reference scenario of the International Energy Agency (IEA 2007, p.73), "world primary energy demand is projected to grow by more than half between 2005 and 2030, at an average annual rate of 1.8 %. Demand reached 17.7 billion toe, compared with 11.4 billion toe in 2005 – a rise of 55 %. Global energy intensity – total energy use per unit of gross domestic product – falls by 1.8 % per year over 2005-2030." (Figure 2). The growth will be dominated by fossil fuels that will confirm themselves as the heart of the world energy system: "Fossil fuels remain the dominant source of primary energy, accounting for 84 % of the overall increase in global demand between 2005 and 2030.". Although oil remains the most important fuel, its share next to the total mix will decrease from 35 to 32 %, settling (in absolute terms) at 160 million barrels a day (37 % more than 2006). The use of coal will grow by 73 %, going therefore from 25 to 28 % of consumption. The share of natural gas will remain almost stable, as, according to the projections, it will go from 21 % to 22 % of the mix. Next to the other forms of energy, the use of electricity will increase noticeably, as it will grow, next to total consumption, from 17 to 22 %. Finally, the greatest part of the foreseen growth is attributed to the developing countries which, thanks to the combination of demographic and economic growth, will be responsible for 74 % of the additional demand – and China and India alone will account for 45 %. It should be noted that, in the alternative scenario of IEA (which assumes the adoption of iron-fisted and effective measures of energy savings and emissions reduction), in spite of the significant reduction of demand (11 % less in 2030), the proportions are not substantially altered. The Agency also elaborates a scenario contemplating high growth – and that can be considered pessimistic from the point of view of the European policy objectives – which is not considered here.

Figure 2

Global primary energy demand in the reference scenario. Source: IEA (2007)



If this is the future we are facing, the environmental implication is clear: in step with energy consumption, greenhouse gas emissions will increase. Even by limiting ourselves just to the emissions linked to energy consumption, in the IEA reference scenario, China and India will be responsible, respectively, for 42 % and 14 % of the emission increases, while the rest of the world (of which Europe is just a part, and not even the largest one) will be responsible for 44 %. In the optimistic scenario of IEA (2007, p.98), the rest of the world will cause just 14 % of the additional emissions, while China will have the lion's share with 52 % and India will follow with 17 %. By 2030, the total increase in emissions will be by 57 % next to 2005, or just 27 % in the alternative scenario (IEA 2007, p.192). The European Union – which in 2005 was responsible for less than 15 % of global emissions – will see its share eroded down to 12 % in 2015 and down to 10 % in the reference scenario, that is, to 11 % in 2015 and 9 % in 2030 in the alternative scenario (IEA 2007, p.199). It is clear that any effort, no matter how intense, will have a relatively small impact on global emissions which, in the last analysis, are the only relevant variable for the phenomenon of global warming. Clini (2007, p.119) writes: "The advantage in terms of the reduction of CO_2 emissions – that can be measured only at the global level – is marginal. The reduction of 20 % of the European emissions in 2020 corresponds to a global reduction of less than 4 %."

Almost by definition, a reduction of this size is destined not to have any effect on climate balances. At most, it can slow down by a modest measure the growth of emissions, acting in such a way that – in the reference scenario, and assuming for the sake of simplicity a linear path between the values of the global emissions estimated by IEA for 2015 and 2020 – we would have in 2020 a level of global emissions which, otherwise, would already have been reach in 2017. The question that arises is whether it is worth committing a significant quantity of economic and political resources – actually, *any* quantity – to achieve such a meagre objective.

3. Do the European climate policies work?

One could object that there is something more important than the effectiveness of the policies at the global level. By means of its own commitment, the European Union can set an example for the international community and create the conditions for which its allegedly "virtuous" behaviour is followed by others. This is the solution to the prisoner's dilemma *à la Bruxelles*: the European actor greatly publicises its actions so as to convince others that the problem is so serious that it requires common action in which all must participate, but in the absence of that action, at least something is done by someone. We are back to European leadership. However, to claim one's own leadership is not enough, as it is necessary for facts to follow words. But from this point of view, the EU does not seem very convincing or determined.

A report published by the European Environmental Agency in December 2007 (EEA 2007) states that the old continent will be able to reach, if not surpass, the Kyoto objectives – that is, an abatement of emissions of 8 % below those of 1990 by 2012. That, however, is true only for the 27-member Union: the new member States are still enjoying the dubious privilege of being former Soviet countries, and as such experienced a sudden and dramatic contraction of emissions after USSR collapse. This, however, is a fact that is not destined to repeat itself, to the point that – as reported by the same EEA (2007, p.6) – "a first assessment of EU27 aggregated projections for 2020 shows that, even if the additional measures currently planned by Member States are adopted and fully implemented, greenhouse gas emissions will increase between 2010 and 2020, reaching a level approximately 2 % higher than in 2005, and only 6 % below their 1990 level." This is certainly not an intentional result, and a smile is irresistible when we detect the tone with which the Copenhagen-based agency hails the ephemeral result that (perhaps) will be reached in 2012 – a tone that saturates the press release informing us of the publication of the study, and the title "EU within the reach of Kyoto targets." [12]

The goal that Europe might meet is even less astonishing if we look at the results that have actually been reached by Europe 15, that is, by that part of Europe which has long said that it has made emissions reduction a priority and which acts accordingly. The EU15 emissions in 2006 (the last year for which official data are available) were 4151.1 MTons CO_2 equivalent, 2.7 % lower than the baseline. That is 0.7 % below 2005, but also slightly above 2002. A further analysis by the same source claims that "The policies and measures in place as of today will not be sufficient for the EU-15 to meet its Kyoto target, as they are expected to push down emissions between 2006 and 2010 to an average level only 3.6 % below the base-year emissions. If the additional measures planned by 10 Member States were fully implemented and on time, a further reduction of 3.3 % could be obtained."[13] Moreover, the appropriate use of the Kyoto mechanisms is estimated to allow for a further 3.0 % reduction, while the use of carbon sinks might induce a further 1.4 % reduction. Optimistic forecasts, therefore, suggest that an aggregate 11.3 % reduction below the baseline can be achieved in the 2008-12 commitment period.

Interestingly enough, last year's estimates claimed that a 4 % reduction below the baseline could be achieved with existing policies (as opposed to 3.6 % in the most recent estimate, a 10 % downsizing), while an extra 7 % reduction could be achieved by adopting the appropriate additional measures, Kyoto mechanisms, and carbon sinks.

12 http://www.eea.europa.eu/pressroom/newsreleases/eu-within-reach-of-kyoto-targets.

13 http://www.eea.europa.eu/pressroom/newsreleases/eu-15-on-target-for-kyoto-despite-mixed-performances

While the actual performance of the EU15 has been downsized, the ability to achieve more significant reductions by other means has been increased by 10 % (from -7.0 to -7.7 %).[14]

To achieve the extra 7.7 % reduction, important steps need to be taken, including the following:

- Full achievement of the objectives foreseen with the existing policies;
- Quick adoption and implementation of policies and additional measures;
- Correction of the emissions by taking into account sinks and land-use changes;
- Utilization to the highest possible level of the flexible mechanisms;
- •Significant overdelivery by some of the member States;
- •Timely observation of the reduction timetable.

All that notwithstanding, at least three member states – Italy, Spain, and Denmark – will not reach the objectives, and probably this is the most accurate forecast of the whole report (EEA 2009).

Even more interesting is the way in which the Union has, so far, reduced its emissions. Table 1 reports the yearly variations declared by EEA together with the explanations that, in its annual communiqués, the agency has supplied to explain the changes. Except for one case (1999), the variation is never attributed to specific policies. In 6 years out of 8, a significant role is attributed to climate conditions – that is, to a factor completely exogenous and which cannot be politically controlled. Then, on and off, the greater or lesser use of coal in the mix is noted, and that mix depends both on industrial choices or long-term policies, and on demand, which in turn depends primarily on the temperature and on economic growth (or lack thereof), as well as on international prices of fossil fuels. It is therefore not an exaggeration to state that if Europe gets more or less close to the Kyoto target, it will depend largely on variables that are independent from climate policies; indeed the single most important variable will be... weather: the warmer (especially by Winter), the lower the emissions will be. The very analyses of the agency therefore show that regardless of the cost, European policies are ineffective, thus inefficient.

Obviously, before the failure of European policies is assessed, a closer look at the European market for emissions rights is needed, which started operating in 2005, a year characterized by mild temperatures as well as by a reduction of emissions as compared to the preceding year. Can we affirm that the European Trading Scheme (ETS) has contributed to the reduction? Or that it had no influence at all? Or that it has worked so poorly as to have slowed down the abatement of emissions? Clearly, the available evidence is bare-bone, and to make a judgement is very complex. However, it is essential to express a first evaluation because from it – and from Europe's ability to identify the limits and strengths of the existing mechanism – depends not only the outcome of the second phase (2008-2012), but also and above all the form of the policy instruments that Europe will provide itself with in view of the ambitious targets set at 2020 and, presumably, the position and credibility of the EU in international negotiations.

The ETS was created with a directive in 2003 and was enforced on January 1st, 2005, slightly over a month before the enforcement of the Kyoto Protocol. However, it helps to remember that the environment in which the Emission Trading Directive matured

14 European Environment Agency, "Greenhouse gas emission trends and projections in Europe 2007", pp.6-7.

TABLE 1

Yearly variations of greenhouse emissions in EU15 (1999-2005)

Year	Emission Variation (*)	Main reasons supplied	Real GDP Growth[1]
1999[2]	-2	• Measure against NO2 in France and the UK; • Measures against HFCs emissions in UK; • Shift from coal to gas (Germany and the UK); • Mild winter in Germany, UK, France, and the Netherlands.	+3
2000[3]	+0.3	• Increase in electricity-related emissions; • Increase of coal in UK; • Continuous growth of emissions in Greece, Spain, Ireland, Italy, Belgium.	+3.9
2001[4]	+1	• Cold winter. • Increase in transportation emissions; • Greater use of fossil fuels for heating and electricity generation.	+1.9
2002[5]	-0.5	• Mild temperatures; • Low economic growth; • Shift from coal to gas.	+1.2
2003[6]	+1.3	• Increase of the carbon share in electrical generation; • Cold winter.	+1.2
2004[7]	+0.3	• Increase in industrial emissions (iron, steel, refrigeration, air conditioning).	+2.3
2005[8]	-0.8	• Reduction in the use of coal; • Mild temperatures; • Increase of diesel next to gasoline (Germany).	+1.8
2006[9]	-0.8	• Warm weather; • High oil & gas prices.	+2.9

1 http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=0&language=en&pcode=tsieb020
2 http://www.eea.europa.eu/pressroom/newsreleases/newsrelease20010423.
3 http://www.eea.europa.eu/pressroom/newsreleases/greenhouse_gas_emission.
4 http://www.eea.europa.eu/pressroom/newsreleases/ghg-2003-en.
5 http://www.eea.europa.eu/pressroom/newsreleases/tec2-2004-en.
6 http://www.eea.europa.eu/pressroom/newsreleases/ghg_inventory_report-en.
7 http://www.eea.europa.eu/pressroom/newsreleases/GHG2006-en.
8 http://www.eea.europa.eu/pressroom/newsreleases/eu-greenhouse-gas-emissions-decrease-in-2005.
9 http://www.eea.europa.eu/highlights/eea-reports-on-progress-in-greenhouse-gas-emissions-reductions-in-2006

Source: EEA. Economic growth (1999-2005). Source: Eurostat

was profoundly sceptical towards the international climate treaty: up to mid-2004, it seemed destined to the trash bin, as it did not seem possible that the number of ratifying countries would be sufficient to exceed the required 55 % quota of 1990 total emissions. That was one of the conditions required by the protocol for its application. It happened only – and surprisingly – in the Fall of 2004, with the announcement and then the ratification by Russia, which in the past was always ferociously critical of Kyoto. The change in Russia's position was due to both the completion of an internal political revolution and external factors. On one hand, President Vladimir Putin managed

to move off the main internal opponent of Kyoto, the former economic head councillor Andrei Illarionov, and managed to surround himself with a growing number of former KGB officers. That also played a role in the sudden change of energy policies, and represented the epilogue of the transition that started with the arrest in 2003 of the oligarch Mikhail Khodorkovsky, head of the private oil giant Yukos. The imprisonment of the tycoon and the dismemberment of the company (whose major assets were moved into the hands of state controlled companies including Gazprom) set off a return to direct, heavy public intervention, with the utilization of energy resources to political ends as well. From that moment on, for a western enterprise to operate in the energy sector in Russia became much more complex. In practice, as Nicolazzi (2004) wrote, Putin's design is that the state can draw "resources from the energy lever and decide whether, if and when, to address them on other sectors." On the other hand, the Kremlin was the focus of effective pressures from Brussels and some time later then president of the Commission Romano Prodi claimed the Russian adherence to Kyoto as his personal success and made it clear that it was the price to pay for European support for Moscow's participation in the World Trade Organization.[15]

At any rate, the fundamental point is that when the European Union designed the ETS, it was convinced that this would be a great jump ahead of the rest of the world , as Europe would place itself in the cosmic void created by the sinking of Kyoto, which did not involve a very large part of the planet, ranging from the United States to the largest emerging economies.

ETS identifies two phases of application: a first pilot phase (2005-2007) followed by a second momentum (2008-2012), coinciding with the period of application of Kyoto and during which companies and countries are called to obtain the objective of emission reductions by 8 % next to the 1990 level. A large census at the European level identified 12,000 plants operating in four large sectors (energy activities including combustion installations with a rated thermal input exceeding 20 MW, mineral oil refineries, coke ovens; production and processing of ferrous metals; mineral industry including cement clinker, glass and ceramic bricks; and pulp, paper and board activities; from the end of the second phase, aviation will be added to the ETS sectors). At the beginning of each phase, a certain number of emission permits is gratuitously assigned to each of these. The distribution of the permits takes place on the grounds of a national allocation plan with which each member State declares the total amount of the emission quotas that it intends to distribute within itself. On April 30th each year, the plant will have to return a number of permits equal to its emissions. If it is unable to do so, or it did not have a way to buy quotas on the market, it must pay a fine of €40 per ton of CO_2 equivalent for the first phase, and €100 per ton in the second phase. The first phase covers only carbon dioxide, while in the second the other greenhouse gases identified by the Kyoto Protocol come into play.[16] Once the fine has been paid, the company's not exempted from cutting its emissions, so €40 and 100 respectively do not work as a cap on carbon price. Finally, the directive does not allow the banking of allowances and their transfer from one phase to another. If the enterprise that holds emission quotas in excess cannot sell them in useful time, their value crumbles to zero.

From this summary description, the three main elements of political arbitrariness of the ETS project emerge: the inclusion of some sectors and not others,[17] the prohibition

15 Nick Paton Walsh, "Putin throws lifeline to Kyoto as Eu backs Russia joining Wto", *The Guardian*, 22 May 2004, http://www.guardian.co.uk/international/story/0,3604,1222190,00.html.

16 CH4, N2O, SF6, i PFC and HFCs.

17 Sectors covered by ETS are responsible fora round half or European total emissions. Other sectors,

of banking the permits, their gratuitous distribution at the beginning of each phase on the basis of the historical emission record in a reference period (the so-called grandfathering). Thus, the choice of the reference period becomes crucial to pick the winners and the losers. Keeping all this in mind is fundamental when the third phase is designed, a phase that will unfold over a greater time interval (2013-2020) and that foresees substantial changes, ranging from the inclusion of new sectors to the adoption of a permit auctioning rather than grandfathering system. It must be added that the negotiation between the member States and the Commission on National Allocation Plans (NAPs) becomes critical to the proper operation of the mechanism, as the difficulty of the path of emission reductions to which a country will be subject depends on it. A further problem comes from the fact that the data on emissions are made public by the European Environment Agency with about one year delay (as opposed to the two years delay for information about total emissions).

This causes the design of the third phase to be devised without knowing how things are going in the second -- and without being able to know until mid 2013.

Furthermore, the albeit small experience accumulated so far by ETS gives rise to perplexities about how well it is operating. The price of the allowances, which at the beginning of the market went up from the initial €7 per ton to settle around €20-25, suddenly crashed. The crash coincides with the publication of the data on emissions by the ETS sectors. At the end of April 2006, eight member states (Czech Republic, Estonia, Lithuania, Netherlands, France, Spain, Sweden and Slovenia) certified to have generated cumulative emissions lower by 46.6 million tons than the available permits. Within a few weeks, the price of CO_2 fell below €20. The announcement of the data concerning other countries delivered the final blow to the value, which went down progressively starting September 2006, and settled permanently well below €1 per ton, where it stayed until the end of 2007. It then shot up again over €20 at the beginning of the year and the beginning of the second phase. The immediate growth reflects the prohibition of banking of excess permits, which couldn't be transferred to 2008-2012.

In 2008, the price of permits showed high volatility around €20-25 per tonne. The value of allowances peaked on January 3rd at €23.54, then sharply decreased down to 18.84 on February 5th, after which began to rise again until July 1st (when allowances expiring in December 2008 were traded at €29.33). A new wave of reductions started and the next turning point was on August 1st (€21.38) when a period of very high volatility took place until October (during these months, prices stayed within the €20-25 band). Finally, as it became obvious that the economic crisis was stronger than expected and that economic performance and industrial activities were hardly hit, a rapid decrease occurred that led allowances prices below €15. With the beginning of 2009, prices had again wide volatility, but the overall trend is still decreasing, and the latest data available showed allowances being traded at or below €10. Interestingly enough, even future prices reflect the downwards trend: the forward prices at December 2012 for allowances is little above €10, well below the above-€17 that were paid in late 2008.

As a matter of fact, emissions from the ETS sector in 2007 (the last year for which verified data are available) were 0.8 % higher than in 2006; and in 2006 they stood 1.1 % above 2005.[18] When this paper is written, data are not available for 2008 yet.

such as ariculture, transportations, services, and buildings are subject to specific regulations aimed at containing GHGs emissions. Finally, other broader policies aim at reducing the whole economy's emissions.

18 http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/787&format=HTML&aged=0&language=EN&guiLanguage=en

It is particularly interesting to focus on price trends in 2005-7: What is the price trend due to, a trend that has effectively nullified the cost of the quota system? According to Stefano Clò (2007), a phenomenon of "over-allocation" in favour of the ETS sectors has taken place. Clò has defined two different benchmarks to evaluate the market – one referring to the pre-2005 period and the other to the year 2005 – and he concluded that "during the first phase the EU15 member States allocated an aggregated amount of 1,657 million permits, corresponding to the 42 % of the EU15 target. This percentage is higher than both the pre-2005 EU15 ETS share (41 %) and the 2005 EU15 ETS share (38 %)... permits have been on average over-allocated to the ETS sectors belonging to the EU15 member States." In practice, the sectors covered by ETS would have obtained an unfairly favourable treatment, and dumped on the society as a whole the largest part of the cost of reductions. This has two consequences. In the first place, ETS has given little or no contribution to the reduction of emissions during the first phase, thus nullifying – at least in part – that first phase. So, the entire reduction effort will have to be concentrated in the five years that have just started, with a significant impact in terms of costs. In the second place, to achieve this result, ETS will have to be managed with a greater severity and the initial allocation of the quotas demands greater inflexibility. The national allocation plans approved by the Commission for 2008-12 reflect a sensitivity to these issues (Brussels has issued 1,439 permits versus the 1,570 requested), but this – and, in junction, the prices of quotas, which went back to pre-2006 levels – allows to predict that the second phase will have tangible costs for the enterprises and consequently for consumers, unless economic crisis is so long that for several years carbon prices are low as a consequence of low industrial activity and low economic growth (or recession).

Other authors, such as Ellerman and Buchner (2006), argued on the contrary that over-allocation didn't take place. In order to reach such conclusion, they defined a benchmark on the basis of 2005 Business as Usual emissions, which proved to be higher than both the allocated permits, and the actual emissions. However, as Stefano Clò (2008, p.10) shows, their analysis "does not indicate how much the ETS is contributing to emissions reductions in Europe compared to the non-ETS sectors and thus to which extent the member States rely on the ETS to achieve their Kyoto emissions reduction target." By relying on a counter-factual scenario, indeed, Ellerman and Buchner were not able to avoid possible biases due to the fact that, among other reasons, the amount of emissions produced before 2005 by the ETS installations was unknown (Grubb and Ferrario 2006).

Over-allocation may have significant, negative consequences (Stefano Clò 2008, pp.23-24). Assuming the overall reduction target will still be met, over-allocation means that part of the reduction burden will be shifted onto non-ETS sectors. Alternatively, national governments might take care of the missing allowances, by directly buying credits, or indirectly by subsidizing non-ETS sectors: in this case, part of the burden would be shifted onto tax payers. Also, over-allocation make less urgent for the ETS sectors to buy international credit, with the consequence that national governments would buy them (Neuhoff et al. 2006). Finally, the overall target might simply be missed because of over-allocation, if neither of the above was done (or not enough) – at virtually no economic cost, but at high political cost.

The inherently political nature of the allocation also shows another side, that is, a unfairness in the distribution of permits amongst the member States. Countries which are relatively less polluting such as Italy have been penalized, while other more energy-intensive nations (above all, Germany) issued an excessive number of permits in the first phase. From this point of view, the second phase does not seem to bring about

anything new. It is true that the Commission has cut the proposal of the member states; however, by fairly cutting, it has preserved the lack of fairness. All the European countries obtained the greater part of the improvement in energy intensity before 1997 (the year when the Protocol was negotiated in Kyoto) and for reasons that are independent of climate policies; but those who have done more are called to a harder commitment than those who instead achieved less. Those who have an energy mix based on gas, the cleanest fossil fuel, do not get rewarded as compared with those who massively depend on coal. And those who have a greater marginal cost of emission reduction do not enjoy any advantage, although that indicates that a tract of the path has been walked already. In this way, we get to the paradoxical situation for which those who are less energy-efficient get, in fact, favourable treatment (Table 2).

Table 2

Net balance 2005 (allocated emissions – verified emissions), energy intensity and carbon intensity in EU15 in 2005

Country	Balance [Megaton]	Energy Intensity [Tep/M€2000]	Carbon Intensity [Ton Co2/Tep]
Austria	-1	150	2.21
Belgium	3	203	1.97
Denmark	14.4	105	2.50
Finland	12	230	1.59
France	19.1	177	1.40
Germany	21	162	2.33
Greece	-0.1	200	3.08
Ireland	-3.1	112	3.06
Italy	-9.5	152	2.42
Luxemburg	0	184	2.64
Netherlands	6.1	183	2.17
Portugal	0.4	210	2.32
Spain	-10.8	194	2.36
Sweden	3	175	0.96
UK	-36.4	132	2.43

Source: European Commission 2007

Please note that amongst the countries that have recorded an important negative balance (Italy, Spain, UK), Italy is the only one that has recorded, in 2005, a near-zero economic growth rate.[19] Unless we take into account the political dynamics behind the initial allocation, the 21 million ton CO_2 excess reported by Germany is not comprehensible. It is true that, in 2005, this country reduced its emissions by 2.3 % (23.5 million tons) next to 2004, but that is mainly due to "a shift from coal to gas in the production of public electricity and heat" and by the reduction of "emissions from road transportation and from households and services". Furthermore, a determining element has been a mild winter and the consequent low demand during the coldest months of the year.[20] At any rate, virtually none of that can be attributed to ETS. The same can be said of France, which furthermore produces about 80 % of its electricity with nuclear power, which has no emissions.

19 In 2005, Italy's economic growth was as low as 0.1 %, as compared with Spain's 3.6 %, UK's 1.8 %, and an average GDP growth for the EU15 of 1.6 %.

20 http://www.eea.europa.eu/pressroom/newsreleases/eu-greenhouse-gas-emissions-decrease-in-2005.

The substantial failure of the first phase, therefore, implies a greater effort – that is, cost – in the second phase. The simple fact that the value of allowances has gone back to over €20 – leaving aside the following fall, mainly due to the effects of the economic crisis, not to emissions reductions due to the ETS – brings back as valid a series of estimates on the comprehensive impact of the reductions that were implemented before or shortly after the enforcement of ETS. The Brussels-based think tank International Council for Capital Formation has estimated the cost for Italy of reaching of the Kyoto targets into a loss of GDP as high as up to 2 % per year below the business-as-usual by 2010 (ICCF 2005). Furthermore, the awareness of the substantial failure of the first phase has caused the Commission to pay greater attention to the second phase and, looking ahead, to the third one. And it is on the latter that it is necessary to focus, both because it is late to intervene on dynamics that are already in motion, and because the size of the objective embraced by Europe is much more ambitious: we are talking about 20 % less emissions than 1990 within 2020, in the eight years following 2012. If the Kyoto objective are to be reached and thus on December 31st, 2012 the emissions of the EU15 will be 8 % lower than 1990, Europe should proceed with an average cut of -2.1 % per year, which is significantly greater than the 1.1 % per year needed during the period 2005-2012.[21]

To the need to set up a system of rules that is certain and stable – a need made cogent by the size of the objectives and by the short time span in which they should be reached – and to the need for equity, the observation on the high level of inefficiency of the system as a whole must be added. Stefano Clò writes: "permits over-allocation to ETS sectors implies that these sectors will have a lower need to recur to international credits to be acquired to comply with national emissions reduction target; thus Finance Ministers and tax-payers will pay for these directly, transforming the international Kyoto flexible mechanism in a largely public-funded markets." And again: "This different treatment [in the various member States] implies that, despite being subjected to the same European regulation, different firms competing in the same market have to bear different environmental costs depending on the State where they are located." This introduces a further dimension of unfairness. The last point concerns the fact that the compliance costs – very low in the first phase and, probably, very high in the second – are just a part of the picture. The administration cost of the ETS must also be considered, and, in particular, the effect that messages that are alternatively reassuring or disturbing about the future regime have on investments. Absent certainty, companies do not invest, and the result is not only that of reducing the reciprocal competitive pressures, but also – especially from the environmental point of view – to reduce the rate of technological innovation and thus, paradoxically, to create an opposite thrust to the objective declared by the policies, that of reducing emissions. The missed or late adoption of innovative and more efficient technologies, in fact, translates into a relative increase of emissions.

4. The new directive

The European Commission is aware of all these criticisms but it finds itself locked by commitments made perhaps too lightly. So, in recent months, we have seen intense work of rewriting of decisions made, culminating in the change of the objective of renewable resources from 20 % of *primary* energy consumption to 20 % of the *final* consumption. This is no small difference. Nor is this decision without repercussions

21 In the beginning of 2005, the EU15 emissions were 0.9 % below 1990, so in the seven years between 2005-2012 (when the First and Second ETS Phases take place) the EU15's emissions are supposed to decrease by further 7.1 percentage points.

on the target of emission reductions. In fact, as Clò and Verde (2007) show, the cut of emissions by 20 % beyond 1990 was a *de facto* objective implicit in the other two that concerned the energy efficiency and green energy quotas. The change of coordinates – which significantly reduce the scope of the commitment, although it still remains very ambitious – together with other frictions we have already highlighted, made a rethinking of ETS indispensable.

The new directive introduces substantial changes, some of which are questionable. Its greatest flaw is in the zone of uncertainty which the directive says it wants to eliminate but instead amplifies. Beyond the statements of principle which change little or nothing, right off the bat the directive sets fair general objectives, such as harmonizing the emission market and creating maximum predictability and stability of choices. Furthermore, it is honestly recognized that "the environmental outcome of the 1st phase of the EU ETS could have been more significant but was limited due to excessive allocation of allowances in some Member States and some sectors."[22] Notably, the Commission claims that ETS "represents the spearhead and 'one of the most important instruments' of EU climate policy due to its ability to achieve absolute emission reductions in an economically efficient manner".[23] There is, though, no agreement on this very issue (Norregaard and Reppelin-Hill 2000).

The new directive foresees the extension of the ETS to other plants or sectors for which it is possible to monitor emissions.[24] A linear path of emissions reductions is foreseen. Starting from the medium value of the second phase, it leads to the target of 2020. Within this general criteria, the directive proposal suggests the overtaking of the national allocation plans, to be achieved by adopting a unified communitarian cap to reach in a time period longer than the five years of the first two phases. In fact, "provides a long-term perspective and increased predictability, which is required for long-term investments in efficient abatement. This can be best achieved by an 8-year trading period until 2020 and a linear reduction of the cap that continues the reduction path beyond 2020, thereby giving a clear message to investors."[25] The other fundamental choice concerning the third phase is about the passage from grandfathering to auctioning in the allocation of quotas, such as to guarantee "efficiency of the ETS, transparency and simplicity of the system and avoids undesirable distributional effects."[26]

Thus, according to the proposed directive by the Commission, starting from 2013, all quotas for the thermoelectric sector will be allocated through auctions. This choice seems to collimate with the preferences of the majority of economists, who recognise two advantages in allocation through quota auctioning: less exposure to political whim (Joscow and Schmalensee 1998), and the ability to generate tax income. In fact, the added value created by the permits does not stay with the enterprises but is made available to the collective. This last point is open to interpretation: it is not certain (in fact, the contrary is more likely) that a larger flow of resources to public finances can be considered advantageous, both from the environmental perspective and that of proper market operation. It is true that the choice of grandfathering creates, due to its very na-

22 European Commission, COM(2008)16, p.2.

23 European Commission, "Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the Community", COM(2008)16, 23 January 2008, http://ec.europa.eu/environment/climat/emission/pdf/com_2008_16_en.pdf, p.2.

24 *Ibid.*, p.4.

25 *Ibid.*, p.7.

26 *Ibid.*, p.7.

ture, an entry barrier. But, ultimately, it is clear that the barrier exists in an auctioning system as well. The cost of entrance is in any case higher than that of the "deregulation" scenario. For those who enter, there is little difference whether the expenditure must be faced at the beginning of the year, during auctioning, or at any other moment by turning to the market.

The first argument about the greater neutrality of auctioning seems to have better foundations. Such concerns disappear, however, as soon as one goes on reading the European directive on emission trading. In spite of the initial call for harmonization and predictability, the exceptions seem far more numerous than the cases to which the presumed rule is applied. One line after stating that allocation for the thermoelectric sector is to be performed through auctioning from 2013 on, the report adds that, "in order to encourage a more efficient generation of electricity, electricity generators could however receive free allowances for heat delivered to district heating or industrial installations."[27] However, the firmness used to pass from free distribution to sale to the highest bidder ends here: for all other sectors, the passage from free distribution to auctioning will take place gradually and in function of several factors.

It should be noted that enterprises are told that, from now to the end of the third phase of ETS, a variable allowances quota will be distributed free of charge. The quota will be different from sector to sector and from year to year, and, within the same sector in a given year, it will change from case to case. But there is more: if the other industrialised countries do not commit to reducing emissions and if (but there is no doubt about this) this establishes a competitive disadvantage for some European enterprises, these will be able to enjoy special free-of-charge quota assignments. To the political uncertainties over distribution of free emission quotas is therefore added the possibility that further free quotas (subtracted from whom? Or are they to delay the reduction objectives?) are assigned to the most energy-hungry enterprises (which ones? And in which sectors?) according to the choices of other sovereign nations. The definition of "certainty" which is in vogue in Brussels apparently includes as a variable the political choices of an undefined number of foreign countries over the next 12 years.

The passage from the report which illustrates the directive proposal that "clarifies" the mechanism – so to speak – deserves to be quoted in its entirety:

> For installations in other sectors [other than thermoelectric], a gradual transition is appropriate, starting with free allocation at a level of 80 % of their share in the total quantity of allowances to be issued, decreasing by equal amounts each year, arriving at zero free allocation by 2020. In the event that other developed countries and other major emitters of greenhouse gases do not participate in an international agreement that will achieve the objective of limiting global temperature increase to 2°C, certain energy-intensive sectors and sub-sectors in the Community subject to international competition could be exposed to the risk of carbon leakage.[28]
>
> This could undermine the environmental integrity and benefit of actions by the Community. The European industry should receive a clear commitment that the Community will take appropriate action. The Commission will review the situation by June 2011 at the latest, consult with all relevant social

27 European Commission, COM(2008)16, p.8.

28 That is, "the risk high emitting industries are either delocalized to sites outside the EU or that competitors outside the EU take over the market share of European companies." See http://www.europarl.europa.eu/news/public/story_page/064-32904-182-06-27-911-20080627STO32878-2008-30-06-2008/default_en.htm.

> partners, and, in the light of the outcome of the international negotiations, submit a report accompanied by appropriate proposals. In this context, the Commission will identify by 30 June 2010 which energy intensive sectors or subsectors are likely to be subject to carbon leakage. It will base its analysis on the assessment of the inability to pass through the cost of required allowances in product prices without significant loss of market share to installations outside the EU not taking comparable action to reduce emissions. Energy-intensive industries which are determined to be exposed to significant risk of carbon leakage could receive up to 100 % of allowances free of charge or an effective carbon equalisation system could be introduced with a view to putting installations from the Community which are at a significant risk of carbon leakage and those from third countries on a comparable footing. Such a system could apply requirements to importers that would be no less favourable than those applicable to installations within the EU, for example by requiring the surrender of allowances.[29]

Essentially, what can be foreseen is an uncertain, unstable and unpredictable system, as the arbitrariness of the Commission is at its height, and – presumably – the clash of lobbies in future years will rise to its height as well. The Commission's design therefore nullifies yet another of the advantages of auctioning -- that is, the de-politicization of at least that slice of allowances that would be put up for auction. It is not clear how all of this could be effected without distorting the internal market. It seems that the Commission is a victim of the conflict between efficiency and equity that was denounced, in connection with a completely different theme, by Rockefeller (2007, p.52), who wrote on "the impossibility of encouraging winners and protecting losers at the same time". By the same token, it is not possible to pursue efficient allocation – where the permits actually go to those willing to pay more – which is fair at the same time. By fair, we mean being careful to not allow excessive growth (whatever that means) in the costs for some less substantial actors, whether these are relatively less developed countries or consumers with less available income.

A similar uncertainty concerns the destination of the cash flow from auctioning. Although it remains available to the member states (and is therefore considered normal tax income), "a certain percentage of the proceeds from the auctioning of allowances should be used to reduce greenhouse gas emissions, to adapt to the impacts of climate change, to fund research and development for reducing emissions and adapting, to develop renewable energies to meet the EU's commitment to using 20 % renewable energies by 2020, for the capture and geological storage of greenhouse gases, to contribute to the Global Energy Efficiency and Renewable Energy Fund, for measures to avoid deforestation and facilitate adaptation in developing countries, and for addressing social aspects such as possible increases in electricity prices in lower and middle incomes."[30] Each of these destinations, as well as the relationship between them, implies a huge question mark, as there is a very ample definition which leaves enormous room for political arbitrariness. In some cases, such as incentives for renewable energy resources or the financing of social tariffs – this overlaps existing programs, introduces further distortions to the electricity market, and potentially creates conflicts with liberalization, since it limits price competition between electricity service suppliers.

It is not the case here to go further into the complex – and, needless to say, arbitrary – mechanisms of the recognition of credits matured through the flexible mechanisms

29 European Commission, COM(2008)16, p.8.

30 European Commission, COM(2008)16, p.9.

of Kyoto. The Commission states its intention to discourage free riding by companies that operate in nations which have not concluded an international agreement, except for those companies which have their headquarters in third nations or administrative entities connected to the European emission exchange system. Here too, what this means *specifically*, and which behaviours are and are not legitimate, is not and cannot be clear.

In general, there is no indication of effort in the proposed directive to put together a system which is what the Commission says it wants, and which is a clear and predictable mechanism. The very choice of auctioning, with its function of the depoliticising of the initial allocation eliminated or at any rate limited, seemingly reduces itself to an infernal mechanism. On one hand, the mechanism acts as a pre-emptive tax on enterprises, who obviously will attempt to pass the costs onto consumers, in a total absence of transparency. On the other hand, it represents a formidable – as well as invisible to consumers, who rightfully do not care about the costs of the manufacturers – source of income that can be destined to both general taxation, and to a series of public expenditures which interfere with the projects in progress and with the good functioning of the market. All that with a further aggravation: as the price of the emission quotas has been and probably will be volatile, the public proceeds of the initial allocation can hardly be forecast. Consequently, governments from time to time will find themselves with a sort of unexpected treasure in their hands, which can be freely expended, virtually without any criterion – a veritable windfall profit for public finances.

The only true – and well questionable – advantage of such a system is that, because of its complexity, it will hardly be able to become the object of true public debate. Paradoxically in view of the premises, this allows an extremely high degree of politicization of the system in each of its stages: in the initial allocation of permits, in the possible additional allocations, in the concession of exemptions or facilitated conditions, and in the use of the revenues. Clearly, the supporters of a restrictive policy of control of emissions have a good game in favouring policies the costs of which are not visible to consumers (Stavins 1998). It is however natural to ask ourselves whether all this is in the public interest – that is, whether this is effective in the reduction of emissions, and efficient in pursuing this end at a contained cost and with the induction of few or no distortions in the internal market (under the non obvious assumption that emissions reductions are in the public interest, in the first place). All in all, the impression is that the Commission is designing a sort of mechanism which is strongly bureaucratic and politicized, and which has the undeclared purpose and the fundamental function of generating a fiscal income and to create opportunities for rent-seeking for the countries, the industries and the firms that are politically stronger and more aggressive.

5. The final compromise

After the presentation of the proposed directive by the Commission in January 2008, a wide debate emerged between member States and industrial sectors, who found several flaws in the proposed plan. Two issues have been emphasized: (a) the risk of carbon leakage and (b) the high costs of the plan. At one point, a wide coalition of countries – including Italy and ten Eastern European member States – threatened to veto the proposal, if their objections had not been considered. In order to achieve the necessary consensus, a number of concessions have been made. A version of the Directive amended accordingly has been advanced by the Commission and approved by the European Parliament in December, with a strong support of the French rotating

Presidency (second semester 2008). The new Directive will reform Directive 2003/87/EC, that created ETS.

The relevant changes are the following:

- A Community-wide quantity of allowances will be defined by 30 June 2010, that will decline in a linear manner from the mid point of the period 2008-2012 by 1.74 % per year (Article 9);
- Allowances will be either auctioned or allocated free of charge (Article 10.1);
- Of the total allowances to be auctioned, 88 % will distributed among the member States proportionally to past verified emissions; 10 % will be distributed between some member States for the purpose of solidarity and growth; 2 % will be distributed to member States "whose GHGs emissions in 2005 were at least 20 % below the reference year" (Article 10.2);
- The use of the revenues from auctioning will be freely determined by member States, provided that at least 50 % of the revenues will be used for at least one between the following (Article 10.3):
  - to reduce greenhouse gas emissions, including by contributing to the Global Energy Efficiency and Renewable Energy Fund and to the Adaptation Fund as operationalised by UNFCCC COP 14 in Poznan , to adapt to the impacts of climate change and to fund research and development as well as demonstration projects for reducing emissions and adaptation , including participation in initiatives within the framework of the European Strategic Energy Technology Plan and the European Technology Platforms;
  - to develop renewable energies to meet the commitment of the Community to using 20% renewable energies by 2020, as well as to develop other technologies contributing to the transition to a safe and sustainable low-carbon economy and to help meet the commitment of the Community to increase energy efficiency by 20% by 2020;
  - for measures to avoid deforestation and increase afforestation and reforestation in developing countries that have ratified the future international agreement ; to transfer technologies and to facilitate adaptation to the adverse effects of climate change in these countries;
  - for forestry sequestration in the EU;
  - for the environmentally safe capture and geological storage of carbon dioxide , in particular from solid fossil fuel power stations and a range of industrial sectors and sub-sectors, including in third countries;
  - to encourage a shift to low emission and public forms of transport;
  - to finance research and development in energy efficiency and clean technologies in the sectors covered by the scope of the directive;
  - for measures such as those intended to increase energy efficiency and insulation or to provide financial support in order to address social aspects in lower and middle income households;
  - to cover administrative expenses of the management of the Community scheme;
- Member States "may also adopt financial measures in favour of sectors or subsectors determined to be exposed to a significant risk of carbon leakage due to costs relating to greenhouse gas emissions passed on in electricity prices, in order to compensate for those costs and where this is in accordance with state aid rules applicable and to be adopted in this area" (Article 10a.6);

- The amount of allowances allocated free of charge will be as high as 80 % of the total in 2013, and will gradually be reduced down to 30 % in 2020 and zero % in 2027 (Article 10a.11);
- Every 5 years the Commission shall determine which sector or sub-sectors are exposed to significant risks of carbon leakage, but the Commission may also add a sector or sub-sector at its own initiative (Article 10a.13).

While some of the shortcomings of the earlier version of the Directive have been apparently fixed, but most of them still remain. Particularly, the high level of uncertainty regarding which sectors and subsectors will enjoy the allocation of free of charge allowances is not reduced. This will comparatively reduce the amount of investments in innovation or measures that might actually reduce emissions. The fact that not just the Commission, but also member States are allowed to put in place measures as to address the risk of carbon leakage – or, more broadly, of competition from firms based in non-restrained markets. Here the paradox emerges: if no protective measure is taken, a risk of delocalization (which would at best leave total emissions unchanged) arises; if carbon-intensive sectors or subsectors are partly or totally sheltered from the effects of ETS, either the reduction burden will be shifted onto other subjects, or targets will be missed.

The most relevant change with respect with the earlier version of the directive is that the transition towards a 100 % auctioning system is significantly delayed. Instead of reaching the target of 100 % auctioning in 2020, the target will be reached in 2027, 7 years later than originally planned as well as 7 years after the policy will be expired. In 2013 – the first year of application of the directive – only 30 % of the allowances will be auctioned. Despite the numerous calls for fairness and non-distorsive measures, the difference between sectors such as electricity, that are required to buy allowances from the very beginning, and others that will be exempted from buying permits might create disparities of treatment that may not be fully justified.

Moreover, and perhaps even most importantly, the potentially distorsive effect of the use of the revenues from auctioning is still in place. The very effect of a cap & trade scheme is supposedly to create a levelled playing field, whereby carbon-based energy sources and carbon-intensive industrial processes are made more costly, and low-carbon or carbon-free technologies are subsequently advantaged. Theoretically, if the overall cap is sufficiently stringent and if not too many sectors or subsectors are recipient of free of charge allowances, there would be little or no need for further incentives or subsidies. In fact, the latter might even distort the well functioning of the electricity market or other markets, by inducing a political allocation, rather than an economically efficient allocation, of resources. On the top of that, renewable energy sources and other low-carbon or carbon-free technologies are already strongly subsidized through a number of policy measures, including (but not limited to) green certificates, white certificates, feed-in tariffs, mandates, etc.

6. An alternative proposal: the carbon tax

The choice of a system of tradable permits, made by Europe at the moment when it launched ETS, responds to many reasonable considerations. The old instruments of command and control proved themselves to be inefficient and often even ineffective. That is even more true in a case such as that of greenhouse emissions, which are created by an extremely high number of sources (virtually any living being emits greenhouse gases and even when we limit ourselves only to human activities, every production process creates CO_2 and other GHGs). The costs of information, and with them those of

control and enforcement, are therefore very high. And not only that: to define technological or performance standard, in this case, is very complicated. That is because not all processes can obtain the same results. In some cases, it is technologically and economically possible to pursue consumption or emission reductions, and alternatives are available. In other cases, that does not happen. The number of scientific uncertainties and the necessarily long-term projection of policies – which should take technological progress into account – multiply the risks that regulation will fail.

In such a situation, powers of discretion are indispensable, and they represent a strong temptation for rent-seekers, and make it almost certain that regulators will be captured.

The alternatives to command and control are economic instruments, which "provide an explicit price signal to regulated firms and individuals" (Hepburn 2006, p.228). These instruments consist of instruments based on price and those based on quantity. Because a regulation of quantities assigns an implicit price to the goods subject to regulation – generally, a polluting substance, the emissions of which are the target of reduction – in ideal conditions the result of the two instruments would be identical. It is also possible to conceive hybrid forms, for example, regulation of quantities with a price cap, a price floor, or both.

In theory, and in the abstract, there is no reason to prefer one instrument over the other (Requate 1993). This is because they are equivalent under ideal conditions. However, when we descend from theory to practice, things change. There are several issues to confront that can direct the choice in either one or the other direction. The main themes concern the efficiency of the policies in the real world, the relative risk of regulatory capture, the extension of uncertainties, and also more general questions such as transparency, the distorting effect of the market, and political acceptability. Finally, considerations concerning transaction costs underlying the creation of an explicit market within a regulation of quantities are of importance. To this end, we will consider here two options: the ETS on one hand – which assigns a cap to greenhouse emissions and allows a market for emission quotas – and the carbon tax on the other, which should reduce consumption (and thus emissions) through an increase of the prices of products or services which are suspected of contributing to global warming, that is, fossil fuels.

From a theoretical point of view, little can be said, especially in terms of the incentive to innovate that different policies can create. Apparently there is no a priori reason to prefer either one (Downing and White 1986; Milliman and Prince 1989). Requate (1998) argues that, while both policy instruments can be preferable under different conditions, a tax system might prevent a real competition between non-polluting technologies. On the contrary, Weitzman (1974) shows that – in a situation of uncertainty about marginal costs – a price instrument is more, or less, efficient than an instrument of quantity when the curve of marginal benefits is relatively less, or more, steep than that of marginal costs. In the case of global warming, as Hepburn (2006, p.232) observes, "suppose the marginal cost of reducing emissions increases quickly as we move from eliminating the cheap, 'low hanging fruit' on to more difficult sources of emissions (e.g. aviation transport). Suppose also that, because damages from climate change are a function of the stock of greenhouse gases in the atmosphere, they are only a weak function of emissions over short periods (e.g. 5 years), so that the marginal benefit from abatement is relatively flat. In such circumstances, a price instrument – a carbon tax – is the appropriate instrument to use." These assumptions are consistent with the available evidence.

In fact, the marginal costs of emission abatement are clearly growing with a relatively steep curve. In the more energy-efficient countries, such as Italy, to cut the emissions is far more expensive than in countries that are less energy-efficient, such as Germany, let alone countries that are far less efficient such as the emerging economies, including China and India. Think, for example, that the efficiency of a coal-powered plant in Europe exceeds 40 %, while in China the average efficiency is around 20 %. If it were possible to export European technology to China for all new installations, it would be possible to obtain, at a relatively low cost, a much more substantial result of the objectives of the Kyoto protocol, assuming that they are reachable and that they are actually materializing later. According to the projections of Montgomery and Tuladhar (2006, p.4), the adoption of an American technology (less efficient than the European technology) for the new investments in the electric sector in China and in India could determine, in 2012, an emission savings more than four times greater than the domestic objectives of the European Union.

Conversely, the marginal benefit of emission reduction grows with a very mild curve, as the forcing of climate grows *logarithmically* next to the atmospheric concentration of greenhouse gases.[31] Nordhaus (2007, p.126) writes: "the structure of the costs and damages in global warming gives a strong presumption to price-type approaches. The reason is that the benefits of emissions reductions are related to the stock of greenhouse gases, while the costs of emissions reductions are related to the flow of emissions. This implies that the marginal costs of emissions reductions are highly sensitive to the level of reductions, while the marginal benefits of emissions reductions are insensitive to the current level of emissions reductions."

In these conditions, an instrument of price regulation seems preferable to one of quantity regulation.

To these considerations on efficiency we can add one concerning the proper operation of the policies. From the institutional point of view, the creation of a market for emission quotas such as ETS – destined to have a growing level of complexity and inclusiveness – implies a commitment, that is, a mobilization of resources for the managing and the maintenance of the necessary administrative infrastructures which is far superior to that of a carbon tax (Helm 2005). That indicates a criticality in the European structure: the Union has decided to give birth to a new bureaucracy that administers a system from which the destiny of a large part of European productive activity depends. The decisions never have an exquisitely technical nature, but come from political evaluations or from difficult and unstable balances of power between lobbies and member States, and within each of these groups. What is worse, the boundaries between these components of the decisional process are fuzzy and hardly distinguishable. All in all, it is virtually impossible to know whether a certain decision – for example, to include a sector in the ETS, allocation of gratuitous quotas, distribution of binding objectives – comes from the work of one or more technical study groups, or from the persuasive arguments presented to policy-makers in smoke-filled rooms.

31 Once a very low threshold is passed (about 50 ppm in volume), each doubling of the concentrations determines an equal increase of the forcing, about 3.7 watts per square meter. Thus, if we move from a CO_2 concentration of 280 ppmv (that of the pre-industrial era) to 560 ppmv – double – the forcing grows by 3.7 watts per square meter; if we go from 560 to 1,120 ppmv, the increase of forcing is still 3.7 watts per square meter (today, the concentrations are about 380 ppmv). It follows that, no matter the complexity of relation between emissions (a flux) and concentrations (a stock), each emission unit saved determines a smaller increase of the forcing less than was due to the previous unit, which instead was sent into the atmosphere.

This uncertainty about the future – and about the decisions that will ensue – provides a valid argument in support of a carbon tax. Because of its nature, a carbon tax guarantees top transparency. Everyone knows that for each ton of CO_2 produced, they will have to pay, say, €25 (just to indicate an amount in line with the forward prices of the emission quota on ETS which is consistent as we shall see with the suggestions of climate economists). To obtain maximum transparency it would be appropriate to imagine a system of transferability, so that the tax is entirely passed on to the consumer. That meets the need to give the consumer the function of allocating the emission reductions in the most efficient way, that is, a way that responds on one hand to a cost criterion and on the other to the relative replaceability of products at greater emission intensity. In this way, the market would be free to operate, although under a substantial bond turned to penalize those productive processes that are the most energy intensive and, upstream, the fossil fuels. The transferability of the tax demands, of course, the traceability of the emissions. But that is possible with relatively low costs, as almost all the reducible emissions come from carbon combustion. Thus, the monitoring must concern only the fuels and the path that they follow to reach the final consumer.

Apparently, the transferability of the tax lends itself to a substantial objection: it could discourage innovation in processes or products that cut the emissions. In fact, the cost of innovation falls on the enterprise, while the saving (the tax that is reduced or cancelled because of the effective reduction of emissions) goes to the advantage of the consumer. In part, this problem solves itself: although the direct advantage goes to the consumer, the ultimate result is that the retail price of the product in question is lower and thus – all other conditions being equal – the demand increases and the market share of the innovative enterprise grows as a consequence. But even if this were not enough – that is, if the additional profits from the greater sales were not sufficient to cover, in a reasonable amount of time, the cost of investments – the system could be reinforced by recognizing a tax credit or other forms of write-offs of the investments employed to reduce emissions. It is obvious that this foresees a spread and sharing of information especially concerning benchmarking to evaluate the innovative contents of the investments, but it certainly defines a more linear, predictable and certain system than that which is strongly bureaucratic and built around ETS.

By the same token, a carbon tax seems less distorting of the market than the current cap & trade, because of a smaller administrative structure and greater predictability. It is true that a tax, just like the emissions ceiling, can be reviewed at any time and increased, thus nullifying the projects of enterprise that were based on the earlier tax. In the case of ETS, however, to the possibility of more or less occasional changes in the structure of the system, we can add a *certain amount of uncertainty* on how the ETS will be applied, which sectors will be actually called to contribute, in what way the gratuitous quota will be allocated, etc. To all that, two further elements must be added. In the first place, a system like ETS required the assignment of sectoral targets, and thus not only does it imply a significant degree of arbitrariness, but also, due to its own nature, it creates continuous clashes of lobby groups. In the second place, and more importantly, a carbon tax is the only way to call all sectors to contribute in the most efficient way to emission reductions. Besides its internal limitations, ETS is also limited to a few sectors, and therefore covers only part of the parties involved in emission reductions. As a result, ETS adds itself to other public policies – which can be of the command and control type but also subsidies or regulatory incentives of various kinds – which in turn induce distortions and high costs. Conversely, a carbon tax because of the way it works would substitute for all that and require, if not a total cancellation (which would be desirable nevertheless), at least a process of resizing, rationalization and simplification of the subsidies, particularly as concerns renewable energy sources.

This leads to another, two-fold basic theme: what is the purpose of a tax? It is obvious that, in a realistic perspective, and beyond the reasons that justify its imposition, a tax has the sole purpose of creating public revenues. In this case, however, and as Albrecht (2006, pp.89-90) explains, "Environmental taxes can, however, be installed with the purpose to change behaviour or with the purpose to collect revenues… Consequently, the tax revenues will also shrink with the tax base." It is probable, however, that the consumption reduction will take place slowly, given both the scarce elasticity of the demand for energy products in a broad sense (transport included), and the long times of the investments return in capital-intensive industries. Thus, the concerns for the reduction of income should not lead to any particular decision in the short term. Albrecht suggests (and this is consistent with the proposal here advanced on transferability of the tax) inserting environmental tax (including a carbon tax) in a general reform of consumption taxes. In the second place, what is to be done with the income of the carbon tax? Should the member States use it, as the European Commission would like to do with a part of the income from the auctioning of permits, to finance environmental programs (whatever could be included under this label, read: anything) does not seem a reasonable solution, as it causes distortions. Furthermore, the carbon tax assigns an implicit advantage to sources and technologies that are "clean", but also puts them all on the same level. Conversely, incentive programs assign differentiated subsidies, further misrepresenting the operation of the market. Since one of the effects of a carbon tax – and the main one from the point of view of consumers – is the increase in the prices of consumption goods including some that are widely used and considered indispensable, such as electricity and transportation fuels, it seems that the request to cut the reform of environmental taxation to fit the principal of fiscal neutrality makes sense. Table 4 shows the increase that some products would undergo in the absence of a reform of the environmental tax if a €25 per CO_2eq ton carbon tax were imposed (in line with the ETS prices, but much greater than that which Nordhaus (2007, p.23) considers to be the optimal short-term tax in the event of global participation).32 The choice of such a high tax is justified both by the coherence with the indications from ETS (which does not reflect the optimal objective, but the administrative one of reducing the emissions by 8 % below the 1990 level by 2012), and by the fact that Europe is alone in its effort is not and probably will not be part of an inclusive global strategy.

Table 3

Simulation of price increases of some energy products with a €25/ton CO2eq carbon tax in the absence of an environmental tax reform

Product	Emissions	Carbon tax €25/ton CO2
Transportation	[kg CO2/litre]	[Euro cent/litre]
Green gasoline (1)	2.35	5.87
Diesel (1)	2.60	6.5
Electric generation	[kg CO2/kWh]	[Euro cent/kWh]
Natural gas (2)	0.40	1
Oil (3)	0.73	1.82
Coal (4)	0.91	2.27

(1) Emissions due to combustion alone; 7-10 % should be added to take into account the emissions concerning refining and transport. (2) Cycle combined with 50 % efficiency. (3) Steam turbines, counterpressure/condensation/conventional with 38 % efficiency. (4) Steam turbines, counterpressure/condensation/conventional with 37 % efficiency

Source: elaboration from various sources

32 "In the ideal world, the carbon price or carbon tax would be $27 per metric ton in 2005 in 2005 prices. (If prices are quoted in prices for carbon dioxide, which are smaller by a factor of 3.67, the optimal tax is $7.4 per ton CO_2)," Nordhaus (2007), p. 23.

Clearly, we are talking about significant figures, which must be handled with extreme caution. The double observation that, on one hand the carbon tax erodes the buying power of income and that on the other hand it is appropriate that the tax is transmitted to the end consumer so as to obtain the most efficient allocation of the reductions, supplies us with an indication as to how to utilize the "little treasure." It can be profitably employed to reduce the income tax rates, which in turn is a strongly distorting tax. Nordhaus (2007, p.129) argues: "If the carbon constraints are imposed through taxes, and the revenues are recycled by reducing taxes on other goods or inputs, then the increased efficiency loss from taxation can be mitigated, so that there is no necessary increase in deadweight loss."

The reduction of income taxes (personal and corporate) is, in a country such as Italy, a priority regardless of climate policies (Giannino 2007).If this road could be pursued, the impact of European climate policies would be more tolerable. And not only that: a (difficult) strategy of comprehensive overhaul of the fiscal system that puts together the introduction of carbon tax with the reduction of the income tax and the rationalization and significant reduction of subsidies of renewable energy sources could, paradoxically, and although the causes are certainly debatable, determine an improvement of the fiscal and normative environment in Europe, and certainly in Italy. At least the deadweight loss would be reduced, which is due to the co-existence of several taxes, all of which more distorsive than a carbon tax. This would be done by introducing certainty and transparency and by truly delegating to the market – although altered by an emission tax – the task of allocating emission reduction. Furthermore, by inducing general relief of fiscal pressure, the carbon tax could represent an important element in the restoration of competitiveness on the old continent. Of course, such a restoration would not be absolute, but it would be effective if part of a comprehensive project and related to the current situation.

Both the carbon tax and a cap & trade system have the effect of increasing the final prices of a series of products. But, while the cap & trade seems to proceed down mysterious paths, the tax acts in visible mode. This visibility establishes two consequences. In the first place, it allows greater price transparency and gives less grounds for vaguely populistic protests, while offering fewer reasons for policies heavily oriented towards price control in moments when, for the most disparate reasons, the prices go beyond a level that is arbitrarily considered too high. In the second place, even the regressive effects of the carbon tax – which are, in substance, the same as the cap & trade – are more visible. The impact on society becomes, therefore, equally visible, and the need to upgrade the fiscal system becomes more felt even from the political point of view.

7. Would a carbon tax work?

The simple simulation above, provides little information about the real extent of a price-based policy. More information are required in order to assess its usefulness.

As it was recalled, a carbon tax of 25 € / TonCO_2eq would impose an extra-cost of 5.87 and 6.5 c€ per litre of gasoline and diesel, respectively. As to electricity, the average increase on the generation cost per kWh would be 1.39 c€. The contribution of each single carbon-based source of energy has been weighed for its own share of 2007 generation (in 2007, 7.2 % of the gross electricity generation in Italy came from oil-fuelled plants, 55.00 % from natural gas power plants, and 14.05 % from the combustion of solid fuels – see Terna 2008). It is assumed that, in the short run, such price increases shall not induce changes in the Italian generation mix, as most of the existing power plants are not yet fully amortized, the life cycle for this kind of capital asset is relatively

long, and anyway the time for licensing, authorizations, and construction of new plants is at least a few years long.

In 2007, the average price for electricity in the IPEX (the Italian electricity exchange) was some 71 € / MWh (GME 2009), equal to 0.71 € / kWh or 71 c€ / kWh. The average price of gasoline and diesel was, respectively, 1.343 and 1.204 € / litre (UP 2009). As a consequence, the average increase in prices would have been by 2 % for electricity, and 4.4 and 5.4 %, respectively, for gasoline and diesel.

To understand what consequences might follow, one should look at the demand elasticity for energy. Price elasticity for electricity is generally found relatively low in empirical studies, especially in the short run. Elasticity in the long run might, however, be more significant. A review of the most recent studies, performed by Lijesen (2007), shows that short run elasticity ranges from -0.04 (Al Faris 2002) to -1,113 (Woodland 1993), with an average value of -0,32. According to the same source, estimates for long run elasticity range from -0.09 (Boonekamp 2007) to -3,39 (Al Faris 2002), with an average value of -0,57. This means that a price increase by 2 %, might be expected to determine a short run demand reduction of 0.64 %, and a long run reduction of 1.14 %.

As far as the demand for motor fuels is concerned, Liu (2004) estimates a short run elasticity of -0.191 for gasoline, and -0.094 for diesel. Long run estimate are, respectively, as high as -0.318 and -0.516. A review of the most recent studies performed by Goodwin, Dargay and Hanly (2004) found an average elasticity for motorfuels of -0.25 in the short run (in the range between -0.01 and -0.57), and of -0.64 in the long run (with a range that varies from 0 to -1.81). This means that a price increase between 4.4 and 5.4 % would result in a reduced demand by around 1.1-1.35 % in the short run, and by 2.8-3.5 % in the long term.

Emissions would be reduced accordingly. Some caution is needed, though. Estimates for price elasticity of energy consumption are extremely diverse – because, among the other reasons, the data tend to be relatively poor, and changes in prices get mixed up with changes in demand due to changes in income (and viceversa). Also, technological progress and public policies may affect energy consumption in several ways, which may not be fully captured in models trying to estimate demand elasticities. As a consequence, the estimates tend to have a very wide confidence interval.

This makes it more difficult to make reliable forecasts of the demand variations in response to a price increase, which exactly what a carbon tax (as well as a cap & trade system, from the consumer's perspective) would result in.

8. Which tax?

The above-mentioned problem can be overcome if a further question is correctly answered. The question is: What is the policy goal? If the goal is to reduce emissions (or energy consumption) by a given amount, *at any cost*, then cap & trade (or even more stringent policies) is probably the better choice. If, instead, the goal is to achieve the most efficient setting from an allocational point of view, i.e. to internalize the external costs, then the real issue is, in the first place, to correctly estimate what are the external costs. In this perspective, the only metric that can be employed to measure the external costs is money (Pearce et al. 1996; Smith et al. 2001). After that complex task has been pursued, it will be possible to compare the cost of global warming's impact with the costs of mitigation measures that are adopted today. It will also be possible to appropriately set prices or quantities, depending on the kind of policy which is implemented. Naturally, such comparison should be made at the margin. Tol (2003) reviewed

the most recent studies on the issue. The findings are the following: "the best guess for the marginal costs of carbon dioxide emissions is $5/tC, but the mean is $104/tC. This difference reflects the large uncertainty combined with the notion that negative surprises are more likely than positive ones." Tol et al. (2001) and Pearce et al. (1996) also argue that estimates exceeding $50 per ton of CO_2 rely on pessimistic and unlikely scenarios for climate change, impact sensitivity and economic values. Subsequently, it can be stated that the marginal costs of climate change are most unlikely to exceed $50 per ton of CO_2, and they are very likely to stand much below that threshold, with a best guess around $5 per ton of CO_2. Climate change impacts are also likely to increase as time passes and atmospheric concentrations of CO_2 rise.

Under the present state of knowledge, there are many ways to design a carbon tax. Two will be presented.

Nordhaus (2007, p.22) proposes a "policy ramp", whereby a carbon tax is imposed which gradually increases. According to Nordhaus, "policies involve modest rates of emissions reductions in the near term, followed by sharp reductions in the medium and long term. Our estimate of the optimal emissions-reduction rate for CO_2 relative to the baseline is 15 % in the first policy period, increasing to 25 % by 2050 and 45 % by 2100. This path reduces CO_2 concentrations, and the increase in global mean temperature relative to 1900 is reduced to 2.4 °C for 2100 and 3.4 °C for 2200." The advantage of such an approach is that it would create a predictable policy path in the future, under which businesses and consumers might make the most efficient choices as to which technologies should be employed, and which would be the most efficient rate of turnover for those technologies. On the other hand, the policy would rely on early estimates for the marginal costs of CO_2 emissions, so it might be not enough responsive to the new evidence. True, it might be revised periodically, but this would (a) reduce its predictability and (b) require a continue re-assessment of the best science by national governments or other international bodies concerned with climate change. While some degree of policy change is necessary, as scientific understanding of global warming provides more information, a continual revision of the policy might not be the best possible solution. In fact, it would require policy-makers to follow the scientific debate up to an extent they are not possibly qualified, and might determine an even stronger politicization of science, which would make the political debate between scientists as much vocal as the scientific debate between policy-makers (Pielke 2006; Lindzen 2008).

The policy would require modest costs to be undertaken immediately, but an increasing cost in the future, as the consequences of global warming become more severe. A gradual increase would be a reasonable compromise between the request to address global warming as soon as possible, and the need to implement policies that do make not too much harm to GDP growth. One might argue that, all else being equal, a faster economic growth implies an increase in emissions, while when GDP slows down, emissions fall too. So the economic impact of the policy would be such that it parallels economic growth, rather than curbing it.

A different proposal can be developed, that allows a built-in correction rule for the tax as evidence becomes clearer. Kelly and Kolstand (1999) and Leach (2007) suggest to test the policy ramp by observing the response of a state variable to the policy itself, as well as to other factors which may or may not be known. A Bayesian learnin routine allows such information to be incorporated in the policy, which would be corrected in both direction – that is, becoming more or less stringent – as its goals become more or less close. Their own research, however, show that in the case of climate change evidence may take a lot a of time before it is properly understood, so that corrections

may not be applied on time or may respond to wrong information or to a poor understanding of the processes.

In taking advantage of these arguments, McKitrick (2008) propose a pricing rule which is designed in a way that it, so to speak, corrects itself, as a reaction to a state function which is easily observable. The real issue, in this perspective, is not the pricing rule per se, but to find an agreement over the state function. In fact, assuming that temperature (or average temperature) can provide the relevant information, it makes a lot of difference, both in temperature levels and in temperature trends, where you take the measure. Surface temperature data's quality has been questioned, both with regard to land temperature (de Laat and Maurellis 2006; McKitrick and Michaels 2007) and over oceans (Thompson et al. 2008; Christy et al. 2001).Measures from weather balloons are also disputable (Lanzante and Free 2008). McKitrick suggests that weather satellites may provide the most stable and reliable metric since when they collect tropospheric data (1979) (Spencer and Christy 1990; CCSP 2006; Randall and Herman 2008). Subsequently, it should be decided where to take temperatures: following IPCC (2007) and CCSP (2006), McKitrick proposes to take reference temperatures in the tropical region, from 20 degrees North to 20 degrees South.

McKitrick, hence, suggests that the mean temperature as measured by weather satellites in the tropical troposphere may provide a workable definition of the state function, that is the input of a pricing rule for a carbon tax policy. Remarkably, "if the present trend continues the Nordhaus path and the state-contingent path would closely coincide." (McKitrick 2008, p.12). The most compelling aspect of such proposal, is that it provides a policy instrument that deals with uncertainty. At the same time, it doesn't need too much of an information exchange between policy-makers and scientists, except for the obvious need to keep correcting the policies if it become clear that anthropogenic emissions are less (more) responsible for climate change, or that climate change impacts are less (more) severe than expected.

A possible objection would be that, by progressively updating the tax according to the temperature measurements in the tropical troposphere (which are subject to a relatively wide natural variability, independent from climate change), one benefit of the carbon tax over a cap & trade scheme (more predictability) might be lost.

Several responses can be provided. First, even Nordhaus' policy ramp would be updated, based upon a less objective variable – climate forecasts vs. actual climate. This is a key point, in terms of limiting the interaction between policy-makers and scientific debates they may not be able to fully understand. Moreover, a consensus might not emerge even within the scientific community, with regard to which projections are to be considered more likely.

Secondly, carbon tax corrections may be scheduled in a way that they do not result in too rapid changes – for example, the carbon tax level may be updated every three to five years, instead of annually, and by doing so it would provide an acceptable level of certainty to energy companies or energy-intensive businesses.

Third, companies themselves may (and in most cases do) have their own scientific experts, who provide the management with an assessment of the best available science. So, companies would have their own expectations regarding climate, and based upon these they can have their own forecasts about the future levels of a carbon tax. A probability level might be attached to any possible scenario, so that companies do have a range of possible alternatives for the future policy paths that depends upon a pricing rule which is known in advance.

Fourth, such process would generate a less politicized, more informed debate on the issue, because from the expectations regarding future temperatures, the future investment strategies would derive. So, any party would have an interest in assessing the *most likely* outcome, not the outcome that would be *most likely to yield the desired politicies*. By the same token, it is probable that more information would be generated and made available, and the understanding of global warming would be improved.

Fifth, it is true that Nordhaus policy ramp relies on projections (so it incorporates some knowledge about the future) while McKitrick pricing rule relies on actual temperatures (thereby responds only to the past). At the same time, however, projections for future temperatures rely on the past record too, and the current temperatures are part of a trend that began long time ago and is expected to continue for a long time in the future. It will take time, in fact, for emission reductions to produce a sufficient reduction in the stock of GHGs in the atmosphere, that will in turn slow down the warming process. So there is a lag – that can't be avoided – between the moment policies enter in force, and the moment when results are delivered. There is a degree of arbitrariness, hence, that can be better filled by relying on objective measures than by adopting questionable – however complex – forecasts about the future.

Finally, the McKitrick's pricing rule for a carbon tax has four major advantages over a cap & trade system.

First, it links the observed temperature – that is, the past temperature trend – with an estimate of the social costs of today's emissions. Its aim is to internalize the external costs, not to "save the world:" it is therefore likely that it would result in the most efficient mix of present consumption, investments in carbon-saving existing technologies, and innovation. On the contrary, a cap & trade scheme requires an assessment on what is the optimum amount of emissions today (a flow) to reduce atmospheric concentrations of GHGs tomorrow (a stock) in order to achieve the goal of containing temperatures increase. Several uncertainties and confounding factors are involved, that might induce misunderstandings or misconceptions. In fact, a major possible (if not probable) shortcoming of a cap & trade scheme lies exactly in the determination of the cap, which is subject to far greater uncertainties and risks of being politically derailed than the determination of the tax in a price-based policy. The problem would be made even bigger by the above-mentioned policy instruments that the European Union and/or other actors are considering in order to put in motion a cap & trade scheme.

Second, under a cap & trade scheme where the cap is set with regard to ambitious environmental goals (e.g., keeping global average temperatures below 2 degrees more than the pre-industrial levels) that may not be completely controlled and that are subject to a number of uncertainties and confounding factors, the scientific debate may tend to become more politicized. In fact, privately-owned companies, rent seekers and national governments may have an interest in promoting one specific scientific view, that might lead to setting a cap more or less stringent, according to their own convenience. Under such a scheme, there would be little room for finding an agreement over an objective, non-politicized indicator.

Third, the price attached to emitting one ton of CO_2 would be far more certain under a carbon tax, whose level is established through a simple, well-known rule, than under a cap & trade system. That is generally true, and even more so as one considers that a number of exemptions and loopholes are created in order to save endangered companies. Price predictability over the medium-long run is a fundamental feature of a policy which aims, among the other goals, at creating a framework for innovation. If uncertainty relative the carbon price adds to "normal" market uncertainties, the payoff

as well as bankability of investments might become less uncertain, too. And, again, more resources might be devoted to lobbying activity and to pay for the price of permits (that, differently from a carbon tax, might be hardly transferred onto consumers), and less resources might be made available for innovative or carbon-saving investments.

Finally, an international agreement over a carbon tax following a simple, predictable rule may be easier to reach, than an agreement creating a complex cap & trade scheme, that national governments can (and most probably will) manipulate in order to meet requests from interest groups. Because of its simplicity, a carbon tax leaves less room for opportunistic behaviors, and might help to fill the lack of mutual trust between the parties.

As an addendum, the revenues from a carbon tax – being more easily predictable – might be employed in reducing income or labor taxes, or other taxes. Therefore, a carbon tax may well be made revenue-neutral. That is far more complex in the case of a cap & trade scheme, both because its revenues would be more uncertain, and because consumers wouldn't perceive it as clearly as they would do with a tax. This makes it more likely that a suboptimal use of the proceedings is made, as in the case of European Union that requires the member States to spend money from auctioning in subsidizing technologies or behaviors, and by doing so is probably going to distort the markets for products and services. In turn, a carbon tax would make irrelevant any other kind of subsidies or mandates, by creating a leveled playing field and by internalizing the external (expected) costs from the use of fossil fuels. In practice, a cap & trade system where part or all the permits are auctioned would be more costly to the consumers and businesses, and more distorsive of the market, than a carbon tax.

9. Conclusions

This paper has critically looked at the European system of emissions trading, attempting to evaluate its effectiveness, efficiency, and sustainability. By doing so, it has highlighted some shortcomings or risks in the present and future policies.

The first aspect has to do with the posture of ETS in the third phase (2013-2020). In particular, the choice of assigning quotas through auctioning, which in theory may be a reasonable choice, has been translated into a system of regulations that is confused, unstable, and ultimately such as to leave a great discretionary power to the Commission and to the governments of the member States. It is not possible to understand how this can be compatible with the objectives of the Lisbon strategy to bring Europe back on the path of an innovative growth that can be sustained, given that political arbitrariness is perhaps the main deterrent of growth (Stagnaro 2005; Sechi and Stagnaro 2006). Nor can it be understood where it is that Europe wants to go, given that the targets that it has assigned to itself are – in the almost unanimous judgement of the experts – extremely difficult if not impossible to realize.

The second aspect, which is a direct consequence of the first, concerns both the definition of the binding objectives and the ways those objectives are implemented. In this paper, the objectives concerning renewable resources and energy efficiency have not been examined, but in substance the considerations on the reduction of the greenhouse gases apply to them as well. The quantification of the objectives has not been preceded by an evaluation of how much was possible to obtain, nor by an estimate of the costs and impacts on the European energy and economic system. By the same token, a discussion of the possible alternatives is missing. Not so much and not just to replace ETS *now*, but to judge its operation through time as compared to other instruments that could have been adopted and which, in spite of the little attention they have received

in Brussels, could perhaps have obtained better results at lower costs. Specifically, the carbon tax option has a series of practical and theoretical advantages, not last the fact that, if the total impact on the European economy is in principal the same as the cap & trade, the administrative costs and the political risks are lower.

As to the third aspect, thinking about the costs of climate strategies means thinking about their benefits as well, and therefore the opportunity of imposing binding domestic targets. This is particularly important in light of both the scientific uncertainties that still remain and are quite substantial – on the global warming phenomenon and on the high probability that will remain politically isolated in the short term in the effort to reduce emissions. From this stems the substantial practical uselessness of the European policies, even if they were justified, effective and efficient, because Europe represents an important but nevertheless minority and decreasing (in relative terms) fraction of global emissions,.

Strictly connected to these questions is the issue of the political feasibility of climate policies. There is virtual unanimity amongst the experts that, from the political point of view, a cap & trade system is easier to launch than a carbon tax, and the European story provides further evidence about that. However, the price of the lesser political resistance is a system that is both opaque and arbitrary. On the contrary, a carbon tax would be more easily implemented, more stable, more predictable, and more responsive to the actual changes in the climate. From a certain point of view, therefore, the lesser political feasibility, due to the difficulty of harvesting consensus on a tax and the need to substantially reformulate the fiscal system, is a further advantage of the carbon tax. The lesser political feasibility guarantees, in fact, not only that the measure will be taken only when a truly large portion of the population is openly willing to pay more to obtain a certain environmental goal. For the same reason, it will be easier to abrogate the tax – a move that is politically less difficult than cancelling regulations as encrusted with lobby activities as they are obscure to most people – when and if it becomes evident that the European strategy is not sustainable, or that the global warming is a less severe problem than what is believed today.

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